



Powerware

**Powerware® Energy Management System (EMS)
Upgrade Kit (208/120V, 380/220V, 400/230V, 415/240V)
User's Guide**

Requesting a Declaration of Conformity

Units that are labeled with a CE mark comply with the following harmonized standards and EU directives:

- Harmonized Standard: IEC 61010-1:2001-02
- EU Directives: 2006/95/EC, Council Directive on equipment designed for use within certain voltage limits
2004/108/EC, Council Directive relating to electromagnetic compatibility

The EC Declaration of Conformity is available upon request for products with a CE mark. For copies of the EC Declaration of Conformity, contact:

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Special Symbols

The following are examples of symbols used on the UPS or accessories to alert you to important information:



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



CAUTION: REFER TO OPERATOR'S MANUAL - Refer to your operator's manual for additional information, such as important operating and maintenance instructions.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.



Three-phase alternating current



PROTECTIVE CONDUCTOR TERMINAL



Do not apply around or remove from hazardous live conductors.

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Chapter 1 Introduction

Eaton's Powerware® Energy Management System (EMS) Upgrade Kit (EMS-UGK) is designed to monitor energy usage of existing power distribution panelboards, remote power panels, or power distribution units. Providing outstanding performance and reliability, the EMS-UGK's unique benefits include the following:

- Monitors up to 42 (single panel) or 84 (dual panel) circuits in a standard three-phase panelboard. Measures and stores energy parameters for each of the individual monitored circuits, letting you manage power with greater precision.
- Functions in a wide variety of applications supporting various data center loads that may require a power distribution monitoring solution, especially where power needs are changing and backup architecture must be scalable.
- Can be mounted on a wall with the included mounting bracket and customer-supplied fasteners appropriate for the type of wall.
- Choice of voltage sensing installation: connection to an unoccupied circuit breaker using included transition harnesses or connection to an occupied circuit breaker using included wire taps.
- Includes a software tool for easy configuring of settings and options.
- All harnesses supplied except for optional external ground.
- No preventive maintenance required other than verifying the hardware and wiring are clear of debris. The EMS-UGK does not require an annual calibration.
- Advanced Metering monitoring system, providing communication options such as network connectivity through the Power Xpert® Gateway Card installed in the X-Slot® communication bay.
- Intended for continuous duty operation.
- Backed by worldwide agency approvals.

The following options for the EMS-UGK are available:

- Single panel (42 circuits) or dual panel (84 circuits)
- 208/120V or 380/220V, 400/230V, 415/240V rating
- Liquid crystal display (LCD) for local indication of energy usage
- Conduit box for enhanced harness protection
- Main input monitoring (three phases and one neutral rated to measure currents up to 400A; up to 100A for input ground)

The following accessories for the EMS-UGK are available:

- Subfeed breaker monitoring, rated to measure currents up to 400A
- 100A branch circuit breaker monitoring
- Temperature and humidity monitoring with the optional Environmental Monitoring Probe (EMP) that is used with the Power Xpert Gateway Series 1000 Card installed in the EMS-UGK

The EMS-UGK includes an externally-mounted enclosure with an optional display. Current transformers (CTs) provide branch circuit monitoring of installed panelboards. Figure 1 shows an example installation of an EMS-UGK.

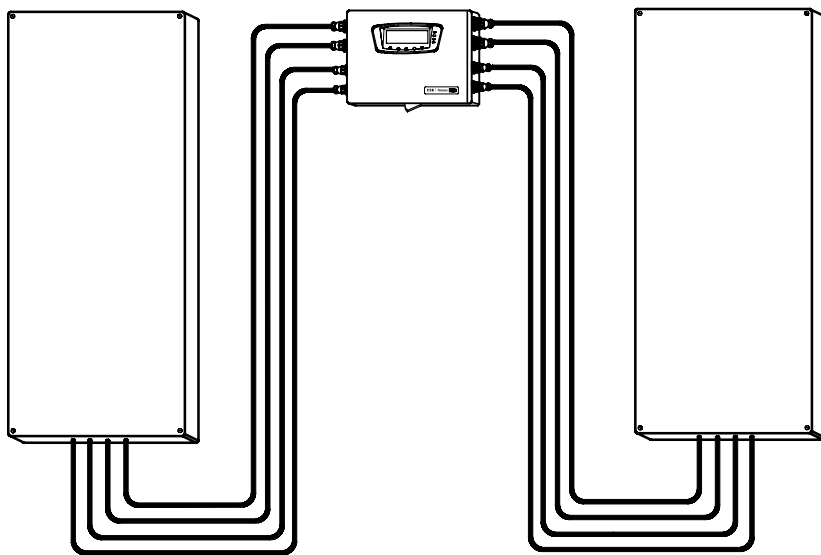


Figure 1. Typical EMS-UGK Installation (Dual Panel Shown with Optional Display)

Safety Warnings

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

This manual contains important instructions that you should follow during installation and operation of the EMS-UGK. Please read all instructions before operating the equipment and save this manual for future reference.



DANGER

This EMS-UGK contains **LETHAL VOLTAGES**. All repairs and service should be performed by **AUTHORIZED SERVICE PERSONNEL ONLY**. There are **NO USER SERVICEABLE PARTS** inside the EMS-UGK.



CAUTION

- To reduce the risk of fire or electric shock, install this EMS-UGK in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% maximum).
 - Use the branch circuit breakers to disconnect hazardous voltage from the EMS-UGK. Turn off the breaker before disconnecting the voltage measuring circuit cables, or hazardous voltage may be present at the exposed end of the cable.
 - Installation or use of the equipment in a manner not specified by the manufacturer may impair the protection provided by the equipment.
-

Consignes de sécurité

CONSIGNES DE SÉCURITÉ IMPORTANTES CONSERVER CES INSTRUCTIONS

Ce manuel contient des instructions importantes que vous êtes invité à suivre lors de toute procédure d'installation et de fonctionnement de EMS-UGK. Veuillez consulter entièrement ces instructions avant de faire fonctionner l'équipement et conserver ce manuel afin de pouvoir vous y reporter ultérieurement.



DANGER!

Cet EMS-UGK contient des TENSIONS MORTELLES. Toute opération d'entretien et de réparation doit être **EXCLUSIVEMENT CONFIEE A UN PERSONNEL QUALIFIE AGRÉÉ**. **AUCUNE PIÈCE RÉPARABLE PAR L'UTILISATEUR** ne se trouve dans la EMS-UGK.



ATTENTION!

- Pour réduire les risques d'incendie et de décharge électrique, installer la EMS-UGK uniquement à l'intérieur, dans un lieu dépourvu de matériaux conducteurs, où la température et l'humidité ambiantes sont contrôlées. La température ambiante ne doit pas dépasser 40 °C. Ne pas utiliser à proximité d'eau ou dans une atmosphère excessivement humide (95 % maximum).

Sicherheitswarnungen

WICHTIGE SICHERHEITSANWEISUNGEN AUFBEWAREN

Dieses Handbuch enthält wichtige Hinweise, welche Sie bei der Installation und Wartung des EMS-UGK beachten sollten. Bitte lesen Sie alle Anweisungen des Handbuches bevor sie mit dem Gerät arbeiten. Bewahren Sie das Handbuch zum Nachlesen auf.

WARNUNG



Die EMS-UGK führt lebensgefährliche Spannungen. Alle Reparatur- und Wartungsarbeiten sollten nur von Kundendienstfachleuten durchgeführt werden. Die EMS-UGK enthält keine vom Benutzer zu wartenden Komponenten.

ACHTUNG



- Um die Brand- oder Elektroschockgefahr zu verringern, diese EMS-UGK nur in Gebäuden mit kontrollierter Temperatur und Luftfeuchtigkeit installieren, in denen keine leitenden Schmutzstoffen vorhanden sind. Die Umgebungstemperatur darf 40°C nicht übersteigen. Die EMS-UGK nicht in der Nähe von Wasser oder in extrem hoher Luftfeuchtigkeit (max. 95 %) betreiben.
-

Advertencias de Seguridad

INSTRUCCIONES DE SEGURIDAD IMPORTANTES GUARDE ESTAS INSTRUCCIONES

Este manual contiene instrucciones importantes que debe seguir durante la instalación y el funcionamiento de la EMS-UGK. Por favor, lea todas las instrucciones antes de poner en funcionamiento el equipo y guarde este manual para referencia en el futuro.



PELIGRO

Este EMS-UGK contiene VOLTAJES MORTALES. Todas las reparaciones y el servicio técnico deben ser efectuados SOLAMENTE POR PERSONAL DE SERVICIO TÉCNICO AUTORIZADO. No hay NINGUNA PARTE QUE EL USUARIO PUEDA REPARAR dentro de la EMS-UGK.



PRECAUCIÓN

- Para reducir el riesgo de incendio o de choque eléctrico, instale este EMS-UGK en un lugar cubierto, con temperatura y humedad controladas, libre de contaminantes conductores. La temperatura ambiente no debe exceder los 40°C. No trabaje cerca del agua o con humedad excesiva (95% máximo).

Chapter 2 Installation

This section explains:

- Equipment inspection
- Unpacking
- Parts list
- Required tools
- Installation and wiring
- Initial configuration
- Advanced Metering installation

Inspecting the Equipment

If any equipment has been damaged during shipment, keep the shipping cartons and packing materials for the carrier or place of purchase and file a claim for shipping damage. If you discover damage after acceptance, file a claim for concealed damage.

To file a claim for shipping damage or concealed damage: 1) File with the carrier within 15 days of receipt of the equipment; 2) Send a copy of the damage claim within 15 days to your service representative.

Unpacking the Cabinet

Use care when moving and opening the carton. Leave the components packaged until ready to install.

To unpack the cabinet:

1. Open the outer carton and remove the items packaged with the cabinet.
2. Carefully lift the cabinet out of the outer carton.
3. Discard or recycle the packaging in a responsible manner, or store it for future use.

Place the cabinet in a protected area that has adequate airflow and is free of humidity, flammable gas, and corrosion.

Checking the Parts List

Verify that the following items are included with the EMS-UGK.

All models
Electronics module (display optional)
Mounting bracket (installed on electronics module)
EMS Configuration Tool CD for setup and calibration
EMS configuration cable (DB-9 to RS-232 serial)
This user’s guide
Power Xpert Gateway Series 1000 Card (installed on electronics module)
Card configuration cable (RJ-45 to RS-232 serial)
Ethernet cable
Power Xpert Gateway Series 1000 Card registration card
<i>Power Xpert Gateway Series 1000 Card Quick Start Instructions</i>
NOTE For more detailed information, download the <i>Power Xpert Gateway Series 1000 Card User’s Guide</i> from the Documentation page on the Power Xpert card once the card is accessible on the user’s network or from www.eaton.com/powerxpert .
All models (for each panel ordered)
(2) Branch circuit harnesses, each with one 28-position circular connector and 21 two-position connector plugs
(44) Branch current transformers (CTs), split-core, 75A, 1V output, with two-position connector receptacle (includes 2 spares) (optional)
(1) Voltage harness, with one 7-position circular connector, three spade connectors (A, B, C), and two ferrule connectors (Neutral, Ground) NOTE Dual panel option only. Voltage harness V2 does NOT include a connector for Ground.
(10) Wire taps: - (5) 4.0 mm ² (12 AWG), yellow - (5) 0.75–2.5 mm ² (18–14 AWG), blue
(3) Wire tap transition harnesses, each with a quick disconnect receptacle and a ferrule connector

Main input monitoring option only (one set for each panel if ordered)

- (1) Main input harness, with one 28-position circular connector and five 2-position connector plugs (A, B, C, Ground, Neutral)
- (4) Main CTs, split-core, 400A, 1V output, with 2-position connector receptacle
- (1) Input ground CT, split-core, 100A, 1V output, with 2-position connector receptacle

Conduit box option only (if ordered)

- Conduit box, left side
- Conduit box, right side, with installed DB-9 extender cable

Subfeed Accessory Kit only (if ordered)

- (3) Subfeed transition harnesses, each with 2 two-position connector plugs
- (3) Branch CTs, split-core, 400A, 1V output, with two-position connector receptacle

100A Split-Core CTs Accessory Kit only (if ordered)

- (10) Branch CTs, split-core, 100A, 1V output, with two-position connector receptacle

75A Split-Core CTs Accessory Kit only (if ordered)

- (5) Branch CTs, split-core, 75A, 1V output, with two-position connector receptacle



NOTE *Accessory kits may be shipped in separate cartons.*

Tools Required

To assemble the components, the following tools may be needed:

- Phillips® #2 screwdriver
- Pliers or other appropriate tool for installing wire taps
- Drill or other appropriate tool for installing customer-supplied wall anchors

Installing the Hardware



NOTE Review the wiring planning requirements in Step 3 on page 14 as an aid to locating an appropriate site for the EMS-UGK.

To install the EMS-UGK on a wall:

- 1. Verify that the wall on which the EMS-UGK is to be mounted meets the recommendations listed in Table 1.

Table 1. Wall Specifications (Customer-Supplied Components)

Component	Specification
Wall surface and wall anchors	Sufficient to support the weight of the EMS-UGK and installed cables (see Table 12 on page 57 for weight specifications)
Clearance around electronics module	Above: 102 mm (4") [152 mm (6") recommended] Below: 102 mm (4") Sides: 152 mm (6")

- 2. Loosen the four front screws, and remove the four rear screws. Remove the mounting bracket from the electronics module. Retain the bracket and four removed screws. See Figure 2.

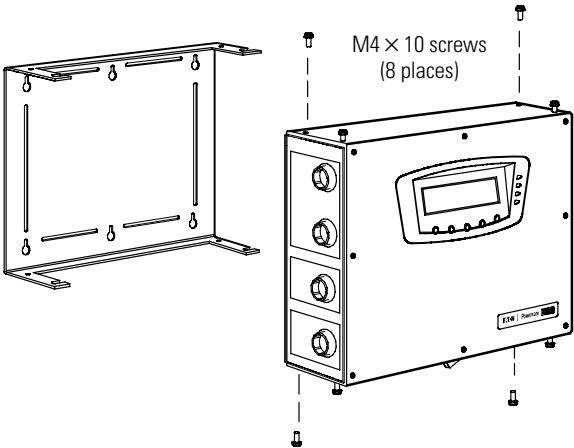


Figure 2. Mounting Bracket and Electronics Module (with Optional Display)

3. Attach the mounting bracket to the wall with appropriate wall anchors (not supplied). See the mounting template in Figure 3.

Verify that at least two wall anchors attach to studs within the wall.

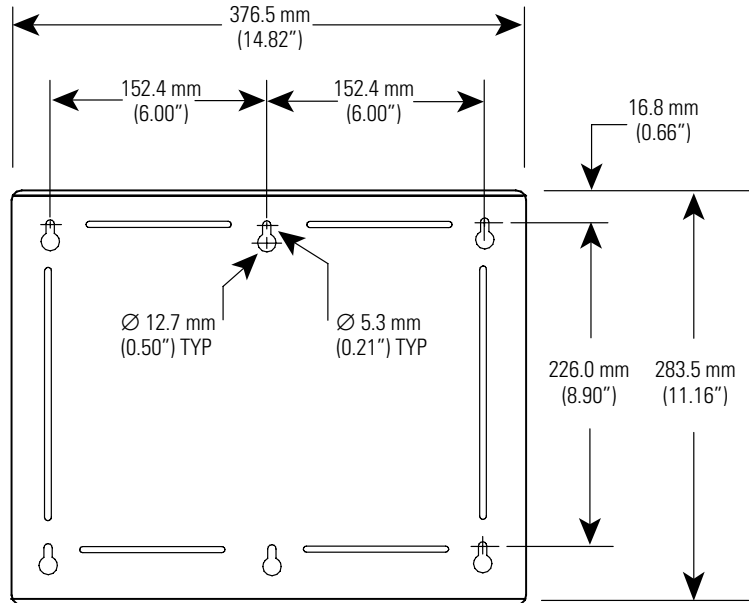


Figure 3. Mounting Template

4. Slide the loosened front screws on the electronics module into the slots on the mounting bracket.
5. Verify all screw holes are aligned. Reinstall the four screws removed in Step 2, but do not fully tighten. See Figure 2.
6. If installing the optional conduit box, continue to Step 7. Otherwise, proceed to Step 11.
7. Remove the front plate from each conduit box. Retain the plates and screws for later reinstallation. See Figure 4.

8. If installing a right conduit box, connect the DB-9 extender cable (installed on the extended serial port on the inside of the right conduit box) to the serial port (Service) on the electronics module.

Figure 4 shows the location of the two serial ports.

9. Slide the conduit box into place on one side of the electronics module. Loosen the mounting bracket screws further if needed.

If installing conduit on both panels, repeat for the other conduit box.

Tighten the mounting bracket screws to secure the conduit box(es).

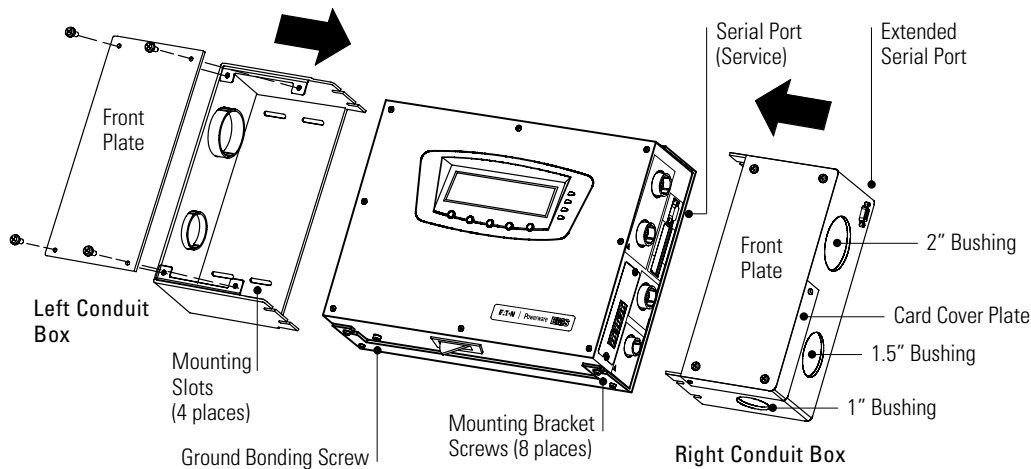


Figure 4. Conduit Box Option

10. **Optional but recommended.** Attach the conduit box(es) to the wall with appropriate wall anchors (not supplied). Use one or more of the four available mounting slots in each conduit box.
11. Verify that all hardware is mounted and aligned properly, then tighten all screws. Verify the hardware is attached safely and securely to the wall.
12. Continue to the following section, "Electrical Connections."

Electrical Connections



WARNING

- Only qualified service personnel (such as a licensed electrician) shall perform the electrical installation. Risk of electrical shock.
- Always follow all personal protective equipment (PPE) and other safety rules when working around electricity.



CAUTION

- Use the branch circuit breakers to disconnect hazardous voltage from the EMS-UGK. Turn off the breaker before disconnecting the voltage measuring circuit cables, or hazardous voltage may be present at the exposed end of the cable.
- To prevent mechanical damage, coil and secure any excess cable away from the floor.

The EMS-UGK is designed for quick and easy installation. Labels on the harnesses describe where to connect the CTs and wire taps. Keyed circular connectors provide a quick and secure installation to the electronics module.

To connect the wiring for the EMS-UGK:



CAUTION

Before wiring the EMS-UGK, disconnect the load and shut down the host equipment. Refer to the user's guide for the host equipment for shutdown instructions.

1. Verify that no circuits on which the EMS-UGK will be installed are energized. Be absolutely sure there is no power.
2. **Optional.** Connect the ground cable (not supplied) from the host equipment to the M5 ground bonding screw on the bottom of the electronics module. Figure 4 shows the location of the ground bonding screw.

3. Plan the wiring route from the electronics module to the monitored breaker panel(s). See Table 2 through Table 4, Figure 5, and use the following guidelines.
 - Mount the electronics module within 3.05m (10 ft) of a disconnect device.
 - If installing conduit (not supplied), plan for adequate conduit routing. Follow National Electrical Code® (NEC®) and local guidelines for conduit length and bending radius. Installed width of the EMS-UGK with both conduit boxes is 633 mm (24.9"). Remove conduit box hole plugs as needed for conduit.
 - Follow NEC and local guidelines for filling wiring space and maintaining the thermal performance of the equipment.
 - Plan the location and installation of the CTs and wire taps to allow for adequate bending radius of wiring. If necessary, support the CTs to avoid undue strain on wiring.

Table 2. Current Transformer Sizing

Type of CT	Rating	CT Dimensions (W × H × D)	Lead Length	Maximum Wire Insulation Outside Diameter
Branch CT	75A	25.4 × 38.1 × 25.4 mm (1.0" × 1.5" × 1.0")	0.91m (36.0")	10.16 mm (0.40")
Branch CT (separate accessory)	100A	41.0 × 51.0 × 30.0 mm (1.6" × 2.0" × 1.2")	1.00m (39.4")	16.00 mm (0.63")
Main CT (phases A, B, C, and Neutral)	400A	96.0 × 100.0 × 46.0 mm (3.8" × 3.9" × 1.8")	0.91m (36.0")	22.86 mm (0.90")
Input Ground CT	100A	66.0 × 70.0 × 33.0 mm (2.6" × 2.8" × 1.3")	0.91m (36.0")	15.24 mm (0.60")
Subfeed CT (separate accessory)	400A	96.0 × 100.0 × 46.0 mm (3.8" × 3.9" × 1.8")	0.91m (36.0")	22.86 mm (0.90")

Table 3. Wire Tap Sizing

Housing Color	Wire Size
Blue	0.75–2.5 mm ² (18–14 AWG)
Yellow	4.0 mm ² (12 AWG)

NOTE Use wire taps ONLY on thermoplastic insulation (PVC).

Table 4. Harness Sizing

Harness	Bundled Length	Connection	Lead Length
Voltage	3.05m (10 ft)	Phases (A, B, C)	0.91m (3 ft)
		Ground (V1 only), Neutral	1.83m (6 ft)
Main Input	2.74m (9 ft)	Phases (A, B, C), Neutral, Ground	304.8 mm (12")
Branch Circuit	2.74m (9 ft)	Circuit Breakers 1/1 – 14/28*	304.8 mm (12")
		Circuit Breakers 15/8 – 28/35*	203.2 mm (8")
		Circuit Breakers 29/15 – 42/42*	101.6 mm (4")
Wire Tap Transition	N/A	Three-Phase Circuit Breaker	101.6 mm (4")
Subfeed Transition	N/A	Subfeed Breaker	50.8 mm (2")

* Circuit breaker numbering: NEMA/Standard (See "Breaker Numbering" on page 37.)

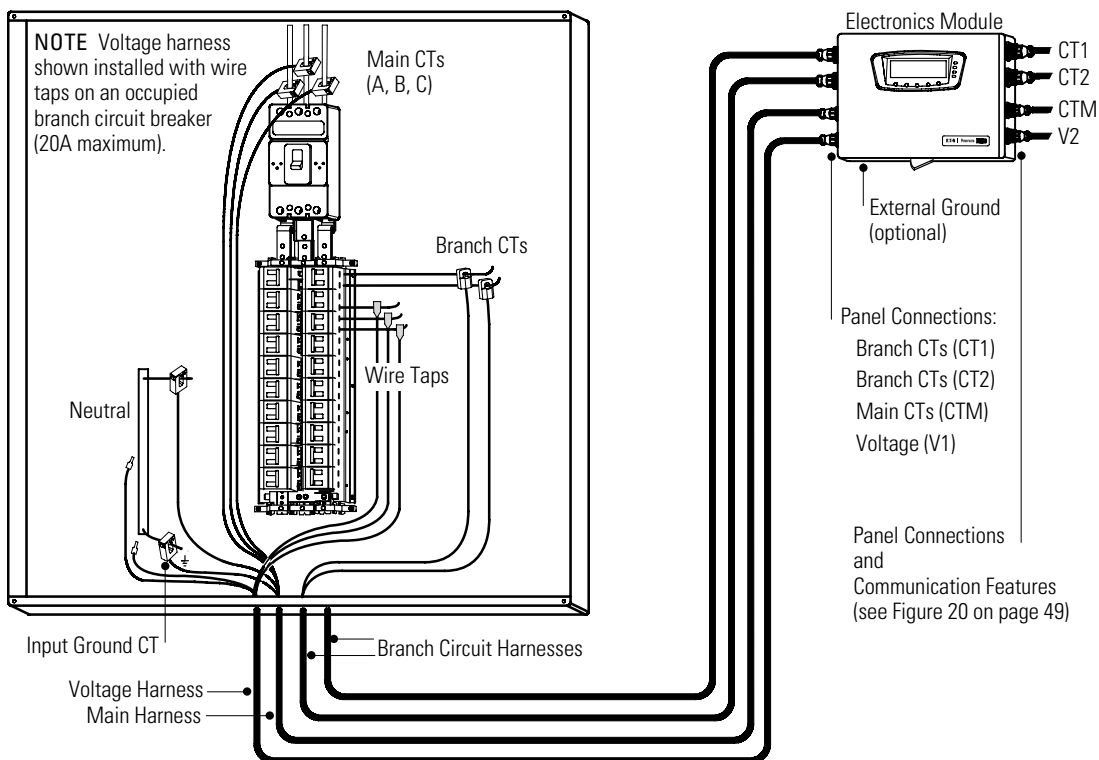


Figure 5. Wiring Overview (Example Installation)

4. Connect the circular connector of each harness to the electronics module. Verify the harness label matches the connector label on the electronics module. See Figure 6 and Table 5. Figure 7 shows a detailed view of both panels.



NOTE To connect a harness to the electronics module, align the polarizing keys and keyways and insert the plug into the receptacle. Rotate the attached coupling ring clockwise until it snaps into position.

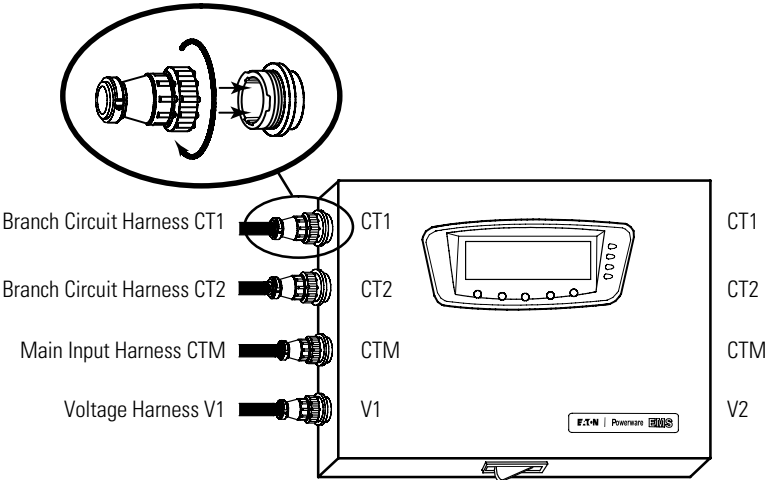


Figure 6. Harness Connections at the Electronics Module

Table 5. EMS-UGK Harness Connections

Connection	Description
CT1	Branch circuit harness from Panel 1 / Input 1 to Panel 1 breaker poles 1–21. Dual panel option only. Branch circuit harness from Panel 2 / Input 2 to Panel 2 breaker poles 1–21.
CT2	Branch circuit harness from Panel 1 / Input 1 to Panel 1 breaker poles 22–42. Dual panel option only. Branch circuit harness from Panel 2 / Input 2 to Panel 2 breaker poles 22–42.
CTM	Main input monitoring option only. Main input harness from Panel 1 / Input 1 to Panel 1 main connections. Dual panel option only. Main input harness from Panel 2 / Input 2 to Panel 2 main connections.
V1	Voltage harness from Panel 1 / Input 1 to Panel 1 reference voltage connection.
V2	Dual panel option only. Voltage harness from Panel 2 / Input 2 to Panel 2 reference voltage connection.

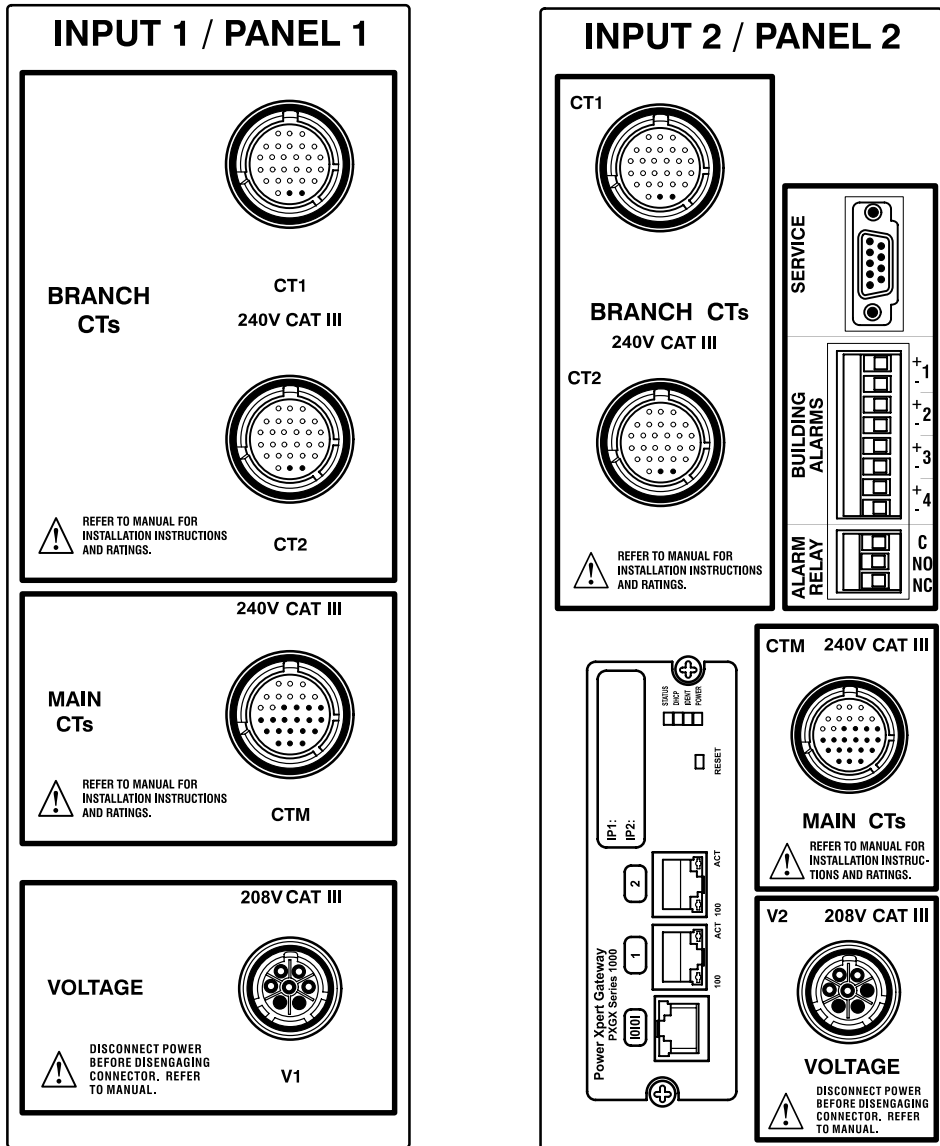


Figure 7. Panel Detail (EMS-UGK-LV Model with Dual Panel Option Shown)



NOTE *Single Panel option only.* Connections for CT1, CT2, CTM, and V2 on Input 2 / Panel 2 are covered with hole plugs.

- 5. Main input monitoring option only.** Connect the main input harness to the breaker panel (see Figure 8):



NOTE If you prefer not to install the Neutral CT, the EMS-UGK software can perform an approximate calculation of the Neutral CT values.

Install the four 400A main CTs to the breaker panel wiring for A, B, and C phases, and Neutral. Install the 100A input ground CT to the breaker panel ground wiring.



NOTE To install a CT, remove the cap, open the body of the CT to insert the wire through the slit, and reinstall the cap. Install all CTs with the "H1" lettering facing the same direction.

Connect each labeled lead on the main input harness (A, B, C, Neutral, and Ground) to the appropriate installed CT. Coil and secure any excess cable away from other conductors.

If installing dual panels, repeat Step 5 for the second panel.



NOTE Verify all installed main input monitoring wiring is correct and follows NEC and local guidelines. Verify all CTs are installed with their "H1" lettering facing the same direction.

NOTE The input ground CT will provide valid readings only in an isolated ground system.

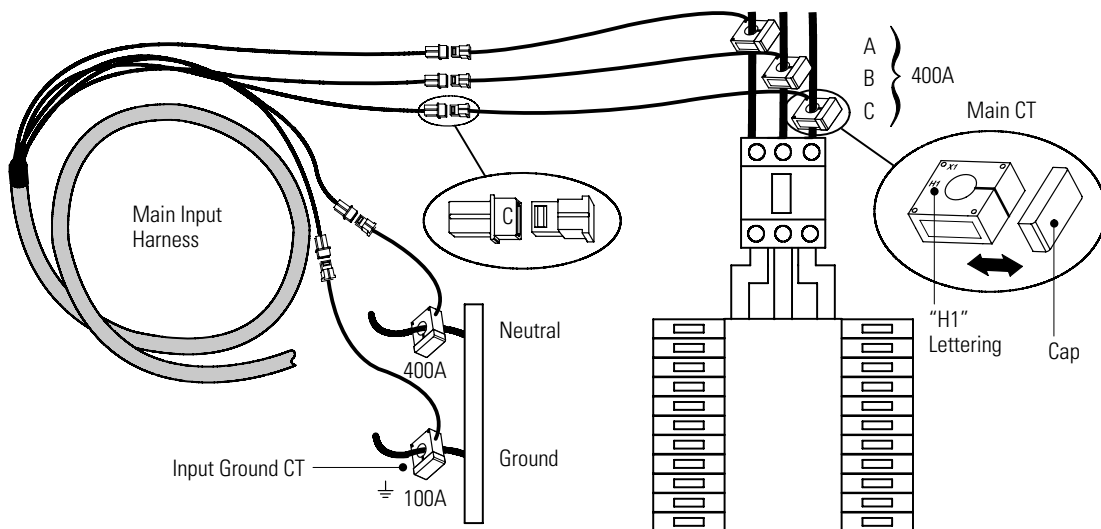


Figure 8. Main Input Harness Connections

6. **75A or 100A Split-Core Branch CT option only.** Connect the two branch circuit harnesses to the breaker panel (see Figure 9):



NOTE Each connector on the branch circuit harness is labeled with two numbers, such as “1/1” or “5/3.” The first number indicates the circuit breaker number according to NEMA breaker numbering; the second number is Standard breaker numbering. See “Breaker Numbering” on page 37 for an explanation of breaker numbering.

For each circuit breaker to be monitored, find its labeled connector on the branch circuit harness, connect a 75A or 100A branch CT to the connector, then install the CT around the output wire connected to the matching breaker.

For example, for circuit breaker 05 in a NEMA panel, connect a CT to harness connector 5/3, then install the CT on the output wire for circuit breaker 05.

Coil and secure any excess cable away from other conductors.

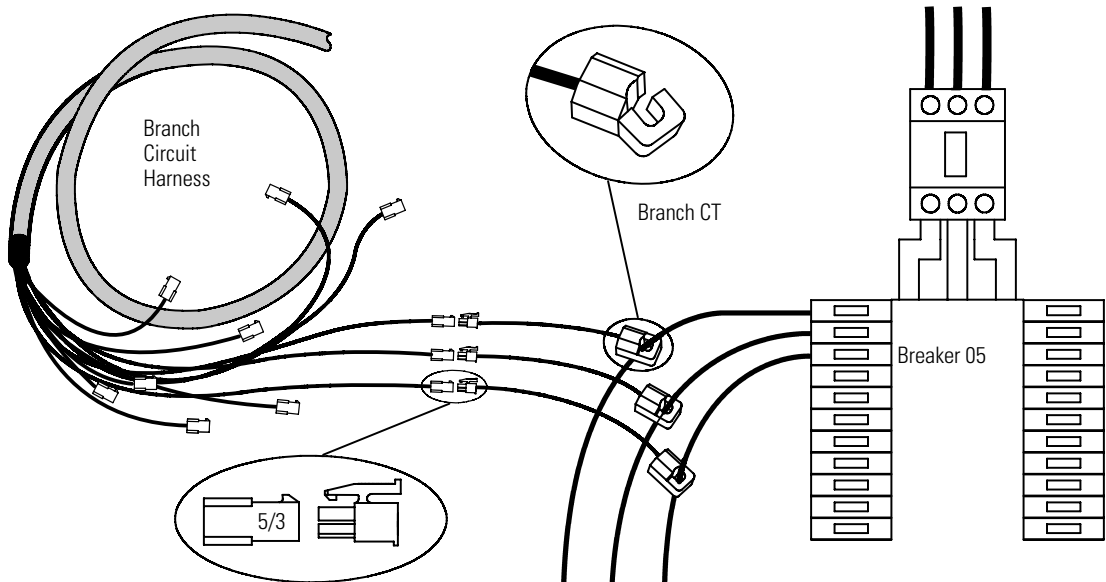


Figure 9. Branch Circuit Harness Connections

7. If installing dual panels, repeat Step 6 for the second panel.
8. Verify all installed branch circuit monitoring wiring is correct and follows NEC and local guidelines.

9. **Subfeed Accessory only.** Locate the Subfeed Accessory Kit (three subfeed transition harnesses and three 400A CTs). Connect a subfeed transition harness to each CT. See Figure 10.

Install each CT around the appropriate subfeed breaker wire.



NOTE To install a CT, remove the cap, open the body of the CT to insert the wire through the slit, and reinstall the cap. Install all CTs with the "H1" lettering facing the same direction.

Attach each subfeed transition harness to the appropriate connection on the branch circuit harness as described in Step 6. Coil and secure any excess cable away from other conductors.



NOTE Verify all installed subfeed monitoring wiring is correct and follows NEC and local guidelines. Verify all CTs are installed with their "H1" lettering facing the same direction.

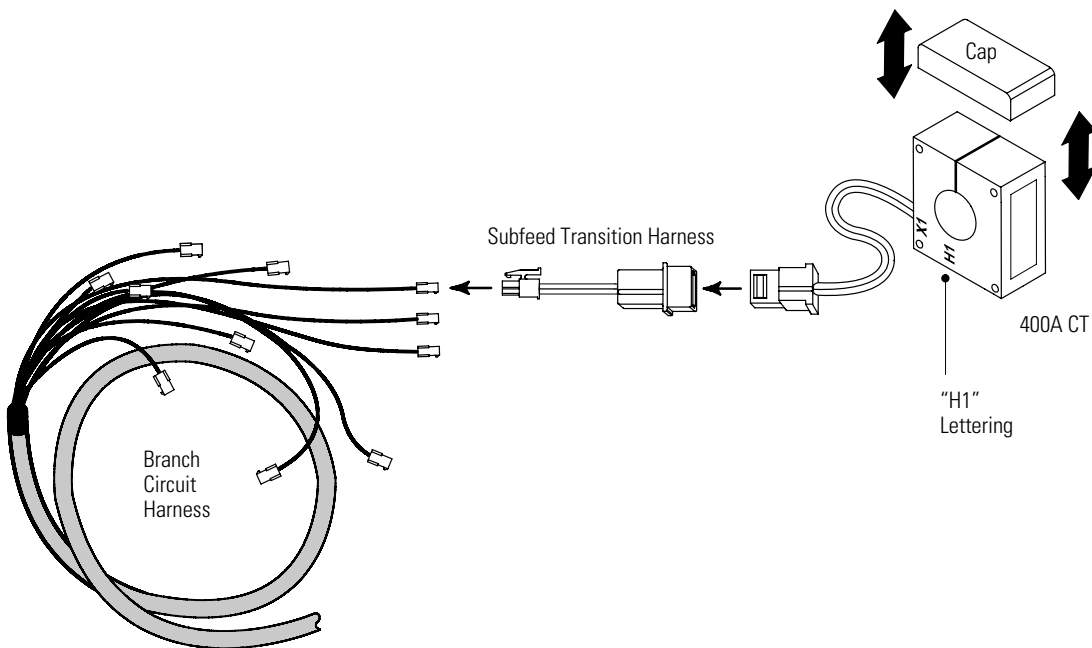


Figure 10. Subfeed Monitoring Connections



CAUTION

- Panel 1 voltage sensing includes a ground wire, but Panel 2 voltage sensing does not. If installing dual panels, connect the voltage harness V1 for Panel 1 first. When disconnecting dual panels, disconnect the voltage harness V2 for Panel 2 first.
- Use the branch circuit breakers to disconnect hazardous voltage from the EMS-UGK. Turn off the breaker before disconnecting the voltage measuring circuit cables, or hazardous voltage may be present at the exposed end of the cable.

10. On the voltage harness V1 for Panel 1, locate the green and yellow Ground wire. Attach the Ground ferrule to a ground point within the panel. See Figure 5 on page 15.
11. Attach the Neutral wire to the Neutral bar in the panel. See Figure 5 on page 15.



CAUTION

Before connecting the voltage harness to a branch circuit breaker, shut down the branch circuit breaker. Risk of electric shock.

12. Choose an option for connecting the phases for voltage sensing:



NOTE *Maximum branch circuit breaker size where the voltage sensing is located is 20A.*

- Use the supplied wire tap transition harnesses to connect the voltage harness to an **unoccupied** three-phase branch circuit breaker (continue to Step 13).
- Use the supplied wire taps to connect the voltage harness to an **occupied** three-phase branch circuit breaker (proceed to Step 14 on page 23).

- 13. Unoccupied three-phase branch circuit breaker connection only.** Verify that the branch circuit breaker is turned off. Be absolutely certain there is no power.

Attach a wire tap transition harness (supplied) to each of the phase A, B, and C connectors on the voltage harness.

Connect the wire tap transition harnesses to the appropriate phase connections of the unoccupied three-phase branch circuit breaker. Coil and secure any excess cable away from other conductors.

Proceed to Step 15 on page 23.

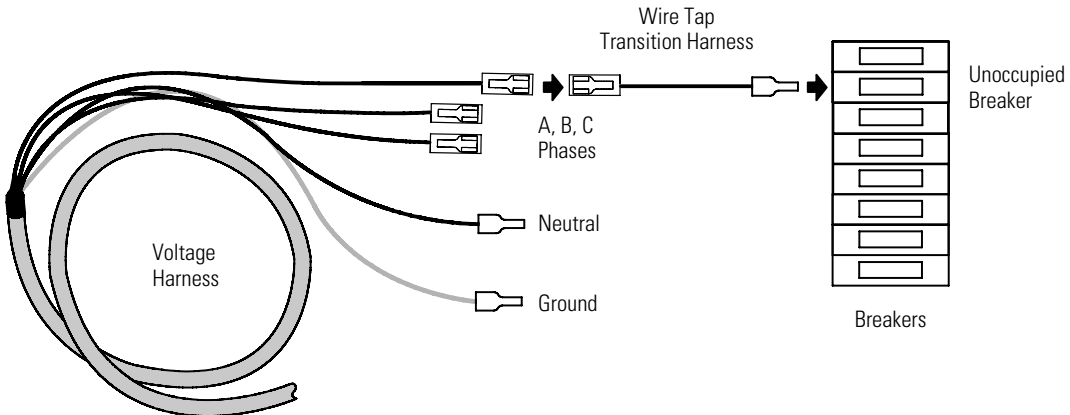


Figure 11. Voltage Harness Connections to Unoccupied Breaker (V1 Harness Shown)



NOTE Use wire taps *ONLY* on thermoplastic insulation (PVC).

- 14. Occupied three-phase branch circuit breaker connection only.** Verify that the branch circuit breaker is turned off. Be absolutely certain there is no power.

Use pliers to carefully install the appropriate size wire taps (supplied) to phase A, B, and C wiring on the occupied circuit breaker. See Figure 12. For sizing, see Table 3 on page 14.

Verify the wire taps are completely closed around the wires.

Connect the phase A, B, and C connectors on the voltage harness to the appropriate installed wire taps. Coil and secure any excess cable away from other conductors.

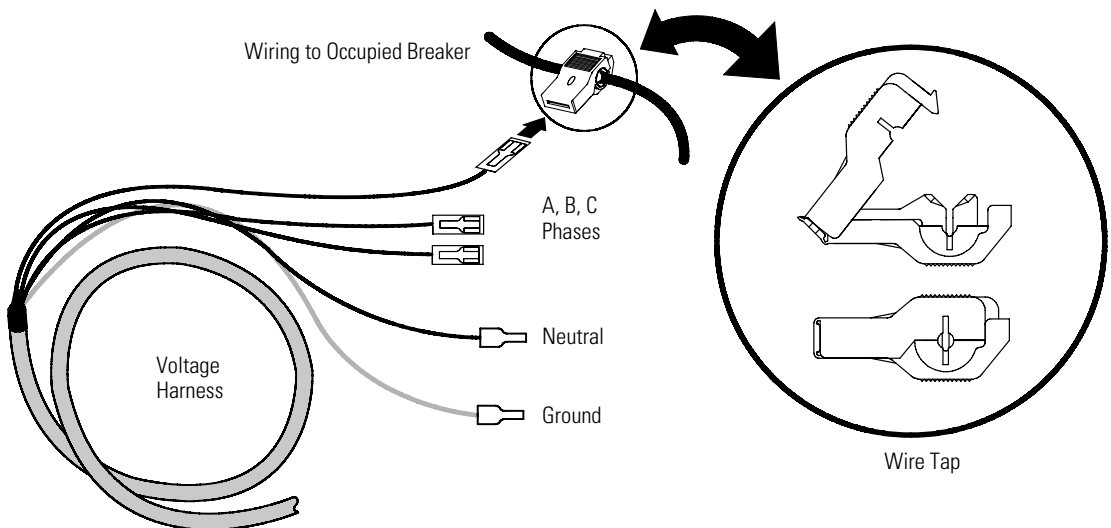


Figure 12. Voltage Harness Connections to Occupied Breaker (V1 Harness Shown)

- 15.** If installing dual panels, repeat Steps 11 through 14 for the voltage harness V2 and Panel 2 for Neutral, A, B, and C phase connections. Panel 2 does not have a Ground connection.
- 16.** Verify all installed voltage monitoring wiring is correct and follows NEC and local guidelines.

17. If installing communication functions, install the wiring for the Alarm Relay and Building Alarms connections. For more information, see "Communication" on page 49.
18. Start up the host equipment. Refer to the user's guide for the host equipment for startup instructions.
19. Activate the reset switch on the bottom of the electronics module: hold the switch for 10 seconds or until the display (if installed) turns off, then release the switch.
20. Verify that the Power LED on the Power Xpert Gateway Series 1000 Card illuminates (see Figure 13).

Display option only. Verify that the display on the front of the electronics module also activates. Press any button to display the mimic screen.

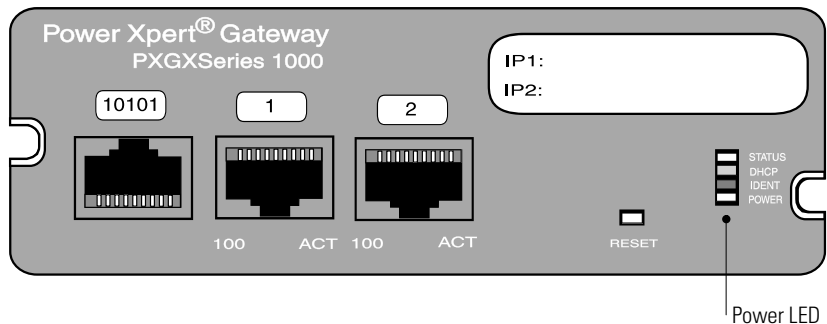


Figure 13. Power LED on the Power Xpert Gateway Series 1000 Card

21. **Conduit Box option only.** Reinstall the top plate on the left conduit box.
22. If installing network connections, proceed to Step 24. Otherwise, continue to the following step.
23. **Conduit Box option only.** If a right conduit box is installed, reinstall the top plate on the right conduit box.
24. Continue to the following section, "Initial Configuration."

Initial Configuration

This section describes how to use the supplied software configuration tool to perform initial configuration and calibration. You can use either the tool or the optional display (if installed) to configure the panels and breakers.

After initial configuration, interface with the EMS-UGK using a Web page interface, the Advanced Metering monitoring system, or (if the optional display is installed) directly through the display.

Installing the Software Configuration Tool



NOTE For best results, install the software configuration tool on a computer running the Microsoft® Windows® XP or Windows 2000 operating system.

To install the software configuration tool:

1. Connect a computer to the service port on the electronics module using the supplied DB-9 to RS-232 serial cable.
2. Set the computer's COM port settings to COM1, 19200 baud.
3. Verify that the computer's settings for the date and time are correct. The configuration tool uses the computer's settings to automatically set the date and time for the EMS-UGK. You can disable this feature later if needed.
4. Insert the EMS Configuration Tool CD into the computer's CD drive. The installation program begins automatically within 10 seconds.

If the installation program does not begin automatically, run the *CD_Menu.exe* program on the CD.

5. Follow the installation program instructions to install the tool.
6. Continue to the following section, "Initial System Configuration."

Initial System Configuration

To configure required and optional system settings:

1. Verify the EMS-UGK is physically connected to all installed CTs.
2. Verify that main voltages are connected and the EMS-UGK is powered on.
3. Click **Start > Programs > EATON > EMS Configuration Tool** to open the configuration tool. The System Status page displays, as shown in Figure 14.

The screenshot displays the 'System Status' page of the EMS Configuration Tool. At the top, there are tabs for 'Panel Config', 'Breaker Config', 'Get Profile/Event Logs', and 'Upgrade Firmware'. Below these are sub-tabs for 'System Status', 'EMS System Settings', 'Calibration', and 'Feature Settings'. The main section is titled 'Main EMS Meters and Status'. It contains two columns of input fields for 'Input 1 (L-N)' and 'Input 2 (L-N)'. The first column includes fields for Voltage A (V), Voltage B (V), Voltage C (V), Frequency (hz), Current A (A), Current B (A), Current C (A), Neutral (A), and Ground (A). The second column includes fields for Unit ID, Unit PN, Unit SN, Unit Status, and VA Rating. To the right of these fields are two large black rectangular areas labeled 'Input 1' and 'Input 2', each with a percentage indicator. Below these are fields for W, VA, and PF. At the bottom left, there is a 'Processor Date' and 'Processor Time' field. A large blue rectangular area is labeled 'Active Alarms (0)'. At the bottom, there is a 'Connect' button circled in red and a 'Not Connected' status indicator.

Figure 14. System Status Page (Not Connected)

4. Click **Connect** to establish communication with the EMS-UGK.

5. Verify that meter and status information from the EMS-UGK displays on the page, similar to the example shown in Figure 15.



NOTE Because the system is not yet configured, active alarms may appear in the Active Alarms window upon connection and may be ignored.

If your system is dual input but only one input displays on the System Status page, click the **Feature Settings** tab and select the **Enable Dual Input Mode** check box. Return to the System Status page to verify that both inputs display (as shown in Figure 15), then continue to Step 6.

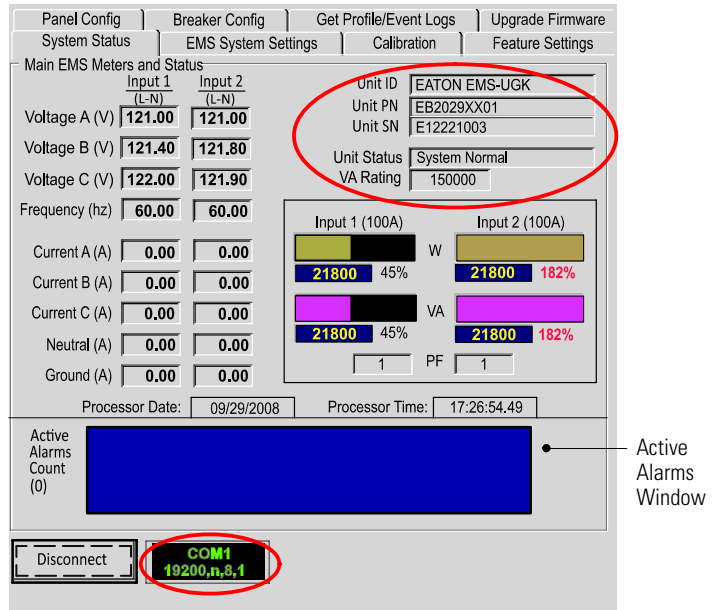


Figure 15. System Status Page (Connected)

6. Click the **EMS System Settings** tab to display the Configure Primary EMS Settings page.
7. Configure the following required settings:

EMS System Setting	Description
Nominal Voltage Settings	Verify the nominal input voltage and frequency settings are correct for your installation. Adjust as needed. NOTE Specify nominal voltage as Line to Neutral voltage (not Line to Line voltage).
Input / Output CT Settings	Main input monitoring option only. Select the type and rating for the input and neutral CTs installed (400A) and for the input ground CT installed (100A). NOTE Configure a CT only if it is installed. NOTE If the neutral CT is not installed, the software calculates its approximate values.
System Name and Rating	(1) Specify a Name for the system: To change the default name, double-click in the Name field and type the new name. Press Enter, then click Yes to confirm. (2) Set the Rating in VA for the installation: This setting matches the summation of the ratings on your panels and is the overload level. To calculate the Rating, multiply the main breaker rating for each panel by the nominal L-N voltage. For example, for two 225A panels and a 120V nominal input voltage, the rating is $225 \times 2 \times 120$, or 54,000 VA. NOTE If your breakers are configured, you can select Auto Calc to have the software automatically calculate the VA rating.
LCD Mimic Screen Display	(1) Select the option that best describes the installation: <ul style="list-style-type: none">• For an EMS-UGK, select EMS-UGK.• For one panel, select 1 In / 1 Out.• For two panels, select 2 In / 2 Out.• For Harmonic Distortion transformers, select 1 In / 2 Out.• For dual input PDUs with Kirk® key interlocks, select 2 In / 1 Out. (2) To display a transformer on the mimic screen, select the check box for Input Transformer Installed. NOTE The transformer symbol is not available for all mimic screen options.



NOTE To revert any changes made on the current page (except System Name) back to default settings before saving, click **Reload Sys Config**.

8. **Optional.** To prevent the software configuration tool from synchronizing with the PC date and time, select **Don't auto update**.
9. Click **Save Sys Config** to save the settings to the EMS-UGK. Depending on communication speed, updates take effect within 15–20 seconds.
10. **Optional.** Voltage and current calibration is performed at the factory. The EMS-UGK does not require calibration. If you choose to recalibrate, the original calibrated values will be lost.

To recalibrate the settings, click the **Calibration** tab to display the EMS System Calibration page.



NOTE For optimal results, verify that the circuits are loaded to nominal load levels prior to starting calibration. Have qualified service personnel (such as a licensed electrician) obtain the physical measurements using a multimeter and RMS current probe. For calibration, measure the L-N voltage (not L-L voltage).

Enter the voltage and current measurements from the installed panel(s) on the EMS System Calibration page. Blank fields will not be calibrated.



NOTE To revert any changes made on the current page back to default settings before saving, click **Reload Cal Data**.

Click **Save Cal Data** to update the voltage calibration data and save the settings to the EMS-UGK. Depending on communication speed, updates take effect within 15–20 seconds.

11. Click the **Feature Settings** tab to display the EMS Feature Settings page.
12. Configure the following Miscellaneous Features:

Feature Setting	Description
Audible Horn Disabled	Select to disable the audible horn. If enabled, the horn sounds for each new alarm and can be turned off by pressing any key on the display.
Meter Simulation Mode Enabled	Select to enable demonstration mode for use with a simulator.
LCD Displays Input 1 V as L to L LCD Displays Input 2 V as L to L	Select to display Line to Line voltages on the display. If unselected, voltages display as Line to Neutral voltages.
Enable THD Alarms	Select to enable Total Harmonic Distortion metering alarms detected by monitor.
Enable Dual Input Mode	Select for dual input models. NOTE Deselecting this option removes all selections and displays for the second input.

13. Configure the following Building Alarm Settings:

Feature Setting	Description
Set Custom Alarm Name	Type a name for Building Alarms 1 through 4.
Contact Type	Select if the Building Alarm is connected as normally-closed.
Action When Active	Select the action to occur when the Building Alarm becomes active.



NOTE To revert any changes made on the current page back to default settings before saving, click **Reload Config**.

14. Click **Save Config** to save the settings to the EMS-UGK. Depending on communication speed, updates take effect within 15–20 seconds.

15. To configure panels and breakers using the software configuration tool, continue to the following section, “Initial Panel and Breaker Configuration (Using the Software Configuration Tool).”

To configure panels and breakers using the optional display, continue to Step 16.

16. Click **Disconnect** to disconnect from the EMS-UGK. Verify that “Not Connected” displays at the bottom of the page.
17. Close the software configuration tool and remove the configuration cable.
18. Activate the reset switch on the bottom of the electronics module: hold the switch for 10 seconds or until the display (if installed) turns off, then release the switch.
19. Continue to “Initial Panel and Breaker Configuration (Using the Display)” on page 34.

Initial Panel and Breaker Configuration (Using the Software Configuration Tool)

To configure the panels and breakers:

1. Click the **Panel Config** tab to display the EMS Panel Settings page.
2. Verify that the **Number of BCM Panels Installed** is correct for your installation.

If you change the value, click **Save Panel Config** to save the setting to the EMS-UGK. Depending on communication speed, updates take effect within 15–20 seconds.

3. Select the panel number to configure (**Panel Selected**).

4. Configure the following settings for the selected panel:

Panel Setting	Description
Panel Rating	Specify the panel breaker rating (in amps). NOTE Setting the panel breaker rating to 0 silences all main panel breaker alarms and zeroes the panel percent current levels.
Panel Warn (%)	Specify the warning threshold level (in percent load).
Panel Alarm (%)	Specify the alarm threshold level (in percent load).
Num Brkr Positions	Specify the number of breakers in the panel.
Panel Name	Specify a panel name (up to 19 characters).
Panel Serial Number	Specify the panel's serial number (up to 19 characters).
Panel Layout	Specify the panel numbering style. NOTE Changing panel layout erases all branch circuit breaker configurations.



NOTE To revert any changes made on the current page back to default settings before saving, click **Reload Panel Config**.

5. Click **Save Panel Config** to save the settings to the EMS-UGK. Depending on communication speed, updates take effect within 15–20 seconds.
6. Repeat Steps 3 through 5 to configure the remaining panels.
7. Click the **Breaker Config** tab to display the Breaker Settings page. The tool automatically updates the default breaker schedule with the latest information from the EMS-UGK. Depending on communication speed, updates take effect within 15–20 seconds.
8. Select the **Panel Number** of the panel containing the breakers to configure. The tool automatically updates the selected breaker schedule with the latest information from the EMS-UGK. Depending on communication speed, updates take effect within 15–20 seconds.

9. The selected breaker is highlighted in **bold** in the schedule. The breaker's configuration details display in the right half of the page.

Click the breaker to configure. The breaker number highlights and its details display at right.

10. Configure the following settings for the selected breaker:

Breaker Setting	Description
Num Phases	Specify the number of phases (1–3).
Breaker Rating	Specify the branch breaker rating (in amps).
Warning Level	Specify the warning threshold level (in percent load).
Alarm Level	Specify the alarm threshold level (in percent load).
CT Ratio	Specify the current transformer ratio (75A). NOTE The selected ratio converts to the value 71.9.



NOTE To revert any changes made on the current page back to default settings before saving, click **Reload Breaker Config**.

11. Repeat Steps 9 and 10 to configure the remaining breakers in the panel.
12. Click **Save Breaker Config** to save the settings to the EMS-UGK.
13. Repeat Steps 8 through 12 to configure the breakers in the remaining panels.
14. Click **Disconnect** to disconnect from the EMS-UGK. Verify that “Not Connected” displays at the bottom of the page.
15. Close the software configuration tool and remove the configuration cable.
16. Activate the reset switch on the bottom of the electronics module: hold the switch for 10 seconds or until the display (if installed) turns off, then release the switch.
17. Continue to “Advanced Metering Installation” on page 36.

Initial Panel and Breaker Configuration (Using the Display)



NOTE Use this section only if the optional display is installed.

Configure the panel and breaker data. You can use the following abbreviated instructions or follow the more detailed steps in “Control Panel Configuration” on page 43.

1. From the setup screen, enter the Level 1 access password (default password is L1).
2. Select **Meters** then **Panel**, highlight the panel to configure, then select **Config**.
3. Set the **Reset** value to Yes and select **OK** to clear any breaker configuration settings for the panel.
4. Configure the following settings to match the physical panel:
 - Phases** (always three-phase)
 - Breakers** (the number of breakers in the panel)
 - Rating** (the rating in Amps of the main panel breaker)
 - Panel Layout** (panel numbering style)
5. Highlight the panel number and select **Schedule**.
6. Highlight the breaker to configure and select **Config**.
7. Configure the following settings to match the physical breaker:
 - Phases** (number of phases for the breaker)
 - Rating** (breaker rating in Amps)
 - Warning** (alarm warning level in %)
 - Overload** (alarm overload level in %)
 - CT** (the CT ratio – specify 71.9)
8. Configure each installed breaker in the panel.
9. If a second panel is installed, repeat the panel and breaker configuration for the second panel.
10. Activate the reset switch on the bottom of the electronics module: hold the switch for 10 seconds or until the display (if installed) turns off, then release the switch.

11. From the setup screen, clear the History Log and Load Profile. For detailed instructions, see “Setup Options” on page 42.
12. Continue to the following section, “Advanced Metering Installation.”

Advanced Metering Installation

The Power Xpert Gateway Series 1000 Card (shown in Figure 16) is factory-installed in the X-Slot communication bay on the side of the EMS-UGK electronics module.

To connect the cables and configure the card:

1. Locate the *Power Xpert Gateway Series 1000 Card Quick Start Instructions* included with the EMS-UGK.

2. Perform all the steps in the quick start instructions, ignoring the initial few steps that describe how to install the card in a PDU.

The quick start instructions direct you to:

- Connect the Ethernet cable
 - Connect the configuration (serial) cable
 - Configure IP Address assignments
3. For more detailed information about installing the card or using Advanced Metering, download the Power Xpert Gateway Series 1000 Card user's guide from the Documentation page on the Power Xpert card once the card is accessible on your network or from www.eaton.com/powerxpert.

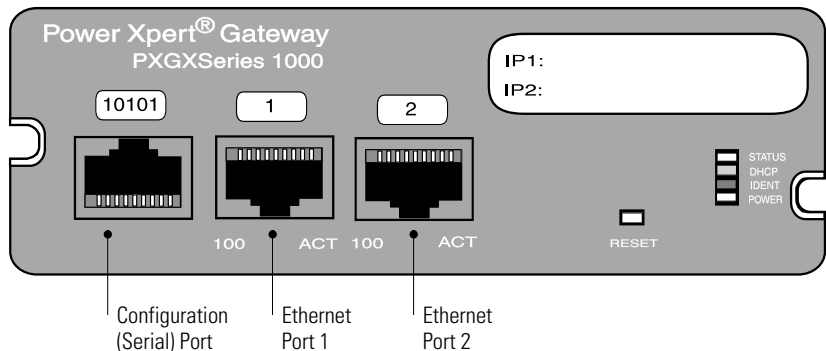


Figure 16. Power Xpert Gateway Series 1000 Card

4. **Conduit Box option only.** If a right conduit box is installed, reinstall the top plate on the right conduit box.

Chapter 3 Operation

This chapter describes how to use the Energy Management System (EMS) Upgrade Kit (EMS-UGK) interface.

Reset Function

The EMS-UGK is intended for continuous duty operation. Cycle power for the EMS-UGK using the reset switch at the base of the electronics module: hold the switch for 10 seconds or until the display (if installed) turns off, then release the switch. The switch is intended for use as a programming reset function.



NOTE The reset switch controls power to the transformer inside the electronics module. The reset switch does not remove three-phase sensing voltage from the Universal Control Board (UCB).

Breaker Numbering

NEMA numbering is left to right in a two-column panel. Odd-numbered breakers are on the left and even-numbered breakers are on the right.

Standard numbering is top to bottom down the left side of the panel, then top to bottom down the right side of the panel.

See Figure 17.

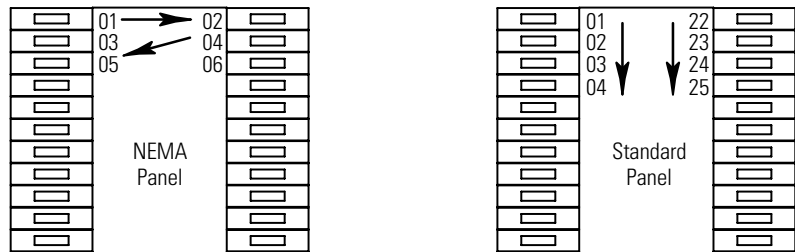


Figure 17. Breaker Numbering

Control Panel Functions



NOTE Use this section only if the optional display is installed.

The EMS-UGK has a graphical LCD with backlight, four status LEDs, and five control buttons (see Figure 18). The display provides useful information about system events, measurements, and settings.

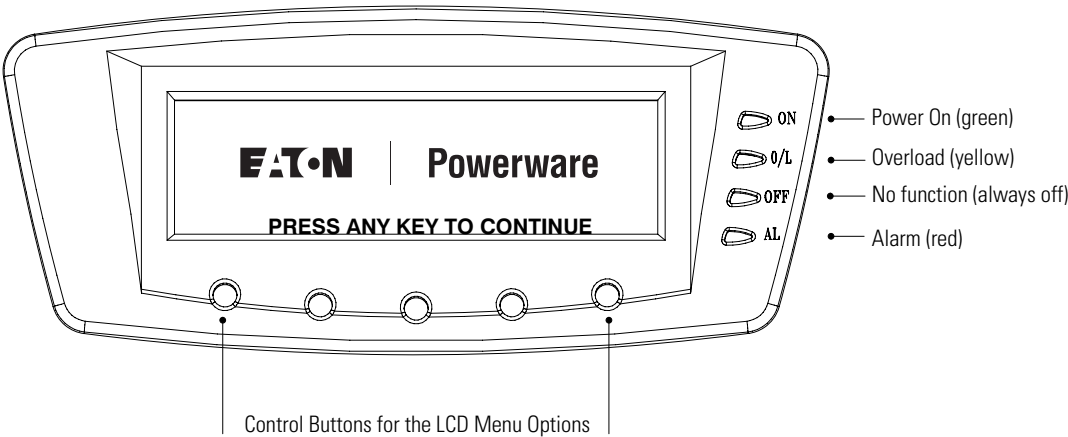


Figure 18. EMS-UGK Display

The following table shows the indicator status and description.

Indicator	Status	Description
ON Green	On	The product on which the EMS-UGK is installed is operating normally.
	Off	The product on which the EMS-UGK is installed is turned off and will not turn on automatically.
O/L Yellow	On	One or more phases is in overload, or there is an alarm or warning for neutral overload, ground overload, main panel breaker overload, or panel breaker overload.
OFF	Off	Not applicable for the EMS-UGK.
AL Red	Flashing	There is a new or cleared EMS-UGK alarm condition. See “Troubleshooting” on page 61 for additional information. To silence the horn, press any button.
	On	An acknowledged alarm condition exists.

Display Functions

The LCD displays the Eaton Powerware logo. Press any button to activate the mimic screen and menu options (see Figure 19). The mimic screen shows a real-time graphical representation of the operating status of the system. At the top of the screen, an information line cycles through displays of information such as the date and time and any active alarms or events.

To select a menu option, press the button below the option name. When available:

- Use the ↑ and ↓ buttons to scroll through a listing of information.
- Use the ← and → buttons to select another item on the screen to view or change.
- Use the + or – button to increase or decrease a selected value.
- Press the ↵ button to return to the previous menu.



NOTE After making configuration changes, you can save your changes immediately by pressing the Reset button on the Power Xpert Gateway Card installed in the X-Slot communication bay. The card resets automatically after five minutes.

The backlit LCD automatically dims after a long period of inactivity. Press any button to restore the screen.

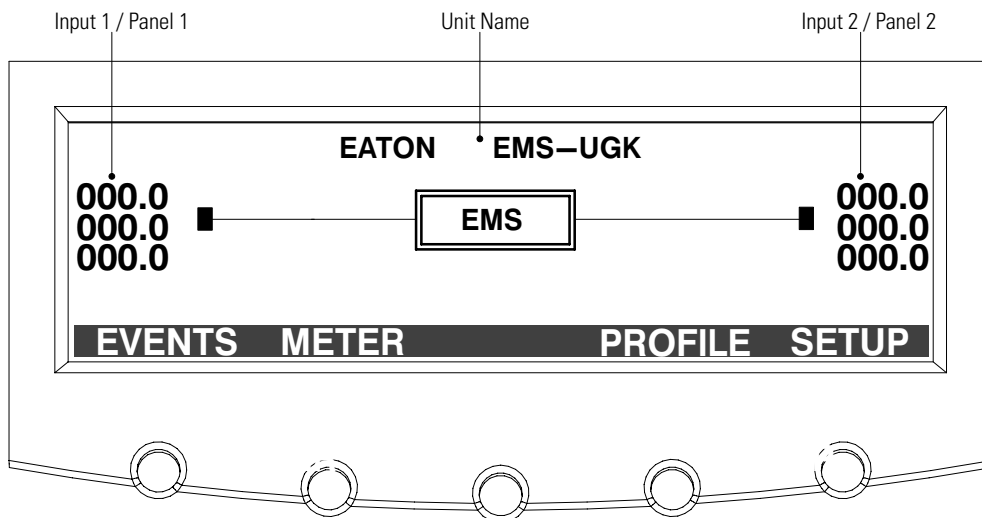


Figure 19. EMS-UGK Mimic Screen and Main Menu

Menu Map

The following tables show the basic menu structure.

Table 6. Menu Map for Display Functions

Main Menu	Submenu	Display Information or Menu Function
Events	Active Events	Displays list of active system events. As events clear, they are removed from the list.
	History	Displays historical log of system events. The log stores the most recent 127 events and alarms.
Meter*	Input 2	Displays Input 2 / Panel 2 performance meters for the system or critical load: RMS / % / THD / Crest / KWH Select PANEL to configure or view panel meters (see Table 7 for detail).** Select PANEL then SCHEDULE to configure or view breaker meters (see Table 8 for detail).**
	Input 1	Displays Input 1 / Panel 1 performance meters for the system or critical load: RMS / % / THD / Crest / KWH Select PANEL to configure or view panel meters (see Table 7 for detail).** Select PANEL then SCHEDULE to configure or view breaker meters (see Table 8 for detail).**
Profile*		Displays load profile for the most recent 24 months. Profile includes highest and lowest input and output currents, frequencies, power levels, power factors, AC undervoltage, THD, and exact time each reading occurred. Current month's profile reflects real-time values.
Setup*		Displays setup options. See Table 9 on page 42 for detail.

* Information displayed depends on product configuration.

** Configuration options are password-protected.

Table 7. Panel Meters

Screen	Label	Meters Displayed
Panel (first screen)	ALM %LOAD Vavg Imax	Alarm status (W for warnings, A for critical alarms) Ratio (in percent) of present load compared to maximum Average voltage Phase with highest current
Panel (second screen)	V1, V2, V3 I1, I2, I3	Voltage per phase Current per phase
Panel (third screen)	I1%, I2%, I3% KW KVA PF	Ratio (in percent) of present current compared to maximum Total kW of panel breakers Total kVA of panel breakers Power factor
Panel (fourth screen)	#BRKS KWH/m KWH/y KWHt	Number of breakers Kilowatt hours per month Kilowatt hours per year Total kilowatt hours
Panel* (fifth screen)	MAX V MAX I	Maximum voltage logged Maximum current logged

* To reset the panel statistics (fifth screen) to zero, select RESET.

Table 8. Breaker Meters

Screen	Label	Meters Displayed
Panel X Breaker Meters (first screen)	ALM CURR% PHASE Irms RTNG	Alarm status Ratio (in percent) of present current compared to breaker rating Phase assignment Current (RMS value) Breaker rating
Panel X Breaker Meters (second screen)	W VA PF WARN OVER	Average W Average VA Average power factor Threshold load (in percent) at which a warning alarm is logged Threshold load (in percent) at which an overage alarm is logged
Panel X Breaker Meters (third screen)	KWH/m KWH/y KWHt	Kilowatt hours per month Kilowatt hours per year Total kilowatt hours
Panel X Breaker Meters (fourth screen)	Imax Wmax VAmx PFmin	Maximum current logged Maximum W logged Maximum VA logged Minimum power factor logged

Setup Options

Access to setup options is restricted to three System Setup Levels: 0, 1, or 2. The higher the level, the more setup options are available. Options on System Setup Level 0 do not require password access.

Table 9. Setup Options

Minimum Level*	Description	Available Settings	Default Setting
0	Enter Password	Use the arrow keys to enter the password for the level you want to access, then select DONE to display the options for the setup level	Level 1: L1 Level 2: Contact your service representative
0	Versions	Read only	Current firmware versions installed
0	Contrast Adjust	Adjust screen contrast with left/right arrow buttons	10%
1	Log Out	Exit the Level 1 or Level 2 setup options and display the Level 0 setup options	None
1	Change Access Level Password	Change the password for the current setup level Use the arrow keys to enter the new password (A–Z, 0–9, –, blank,), then select DONE to save the new password.	None
1	Set Date and Time	Set Month, Date, Year (mm/dd/yyyy) Set Hour, Minute (Time is a 24-hour clock.)	00/00/0000 00:00
1	Clear History	Clear the History Log	None
1	Clear Load Profile	Clear the Load Profile	None
1	Building Alarm Setup (see page 53)	For Building Alarm 1 through Building Alarm 4: Name String [up to 19 characters (A–Z, 0–9, –, blank)] Settings: Contact Normally Open or Closed Building Alarm Type (REPO, EPO, TVSS/SPD, Custom) Notice Level (Log and Alarm options) Enabled/Disabled	BUILDING ALARM [X] Open 1 and 2: Custom; 3: REPO; 4: EPO Log Only Enabled
1	THD Alarm Level	Set the voltage and current Total Harmonic Distortion for Input 1 and Input 2, and enable or disable this feature: THD settings Enabled/Disabled	5.0 Disabled
2	Unit Type	Read only: Model / CTO / Serial	Factory-set identifiers
2	Unit Name	Up to 19 characters (A–Z, 0–9, –, blank)	EATON EMS-UGK
2	Reset All Lower Level Passwords	Reset the Level 1 password to the default setting	None

* Minimum System Setup Level required to access the setup option.

Control Panel Configuration



NOTE Use this section only if the optional display is installed.

To set up branch circuit monitoring on your product, configure the panels and branch circuit breakers. Configuration requires System Setup Level 1 password access.

Accessing Configuration

To access the configuration options at System Setup Level 1:

1. In the Setup menu, select ENTER PASSWORD.
2. Use the arrow keys to enter the password (default password is L1 for Level 1).
3. Select DONE. The screen displays the setup options.

To change the default password while logged into System Setup Level 1 access:

1. In the Setup menu, select CHANGE ACCESS LEVEL PASSWORD.
2. Use the arrow keys to enter the new password (A–Z, 0–9, –, blank).
3. Select DONE.

Configuring Panels Containing Branch Circuit Breakers

To configure panels containing branch circuit breakers:

1. If not already obtained, access the System Setup Level 1 password level. See the previous section, “Accessing Configuration.”
2. From the main menu, select METER then PANEL.
3. On the PANEL screen, select the panel number (PNL) to configure, and then select CONFIG.


4. On the PANEL CONFIG screen, set the panel's meter settings:

Default	Range	Meter Setting	Description
3	3	PHASES	Number of phases
42	0–42 (even numbers)	BREAKERS	Number of branch circuit breakers in the panel
100	0–1200	RATING	Panel breaker rating (in amps) (see Note 1)
STANDARD	STANDARD COLUMN	PNL LAYOUT	Panel layout (see Note 2)

NOTE 1 Setting the panel breaker rating to 0 silences all main panel breaker alarms and zeroes the panel percent current levels.

NOTE 2 Changing panel layout erases all branch circuit breaker configurations.

To reset all values on the screen to defaults, set the RESET value to YES.

5. Select OK.
6. Repeat Steps 3 to 5 for each panel containing branch circuit breakers to configure.
7. When all panel configuration is complete, select the  button repeatedly to reach the main menu.
8. If all configuration is complete, save your changes by pressing the Reset button on the Power Xpert Gateway Card in the X-Slot communication bay. (The card automatically resets after five minutes.) Otherwise, continue to “Configuring Branch Circuit Breakers” on page 46.

Configuring Panels Containing Subfeed Breakers

To configure panels containing subfeed breakers (up to 12 per panel):

1. If not already obtained, access the System Setup Level 1 password level. See “Accessing Configuration” on page 43.
2. From the main menu, select METER then PANEL.
3. On the PANEL screen, select the panel number (PNL) to configure, and then select CONFIG.

4. On the PANEL CONFIG screen, set the panel's meter settings:

Default	Range	Meter Setting	Description
3	3	PHASES	Number of phases
42	0–42 (even numbers)	BREAKERS*	Number of subfeed breakers in the panel, times 3
100	0–1200	RATING	Subfeed breaker rating (in amps) (see Note 1)
STANDARD	STANDARD COLUMN	PNL LAYOUT	Panel layout (see Note 2)

* For example, if the panel has 6 subfeed breakers, set the BREAKERS value to 18.

NOTE 1 Setting the panel breaker rating to 0 silences all main panel breaker alarms and zeroes the panel percent current levels.

NOTE 2 Changing panel layout erases all branch circuit breaker configurations.

To reset all values on the screen to defaults, set the RESET value to YES.

5. Select OK, the panel number (PNL), then SCHEDULE.

On the PANEL SCHEDULE screen, each subfeed breaker displays as a group of three phases.

6. Select the ← button to return to the PANEL screen.
7. Repeat Steps 3 to 6 for each panel containing subfeed breakers to configure.
8. When all panel configuration is complete, select the ← button repeatedly to reach the main menu.
9. If all configuration is complete, save your changes by pressing the Reset button on the Power Xpert Gateway Card in the X-Slot communication bay. (The card automatically resets after five minutes.) Otherwise, continue to the following section, "Configuring Branch Circuit Breakers."

Configuring Branch Circuit Breakers

Follow the appropriate steps to configure, remove, or change the branch circuit breakers.

To configure the branch circuit breakers (up to 42 per panel):

1. If not already obtained, access the System Setup Level 1 password level. See “Accessing Configuration” on page 43.
2. From the main menu, select METER then PANEL.
3. On the PANEL screen, select the panel number (PNL) to configure, and then select SCHEDULE.
4. On the PANEL SCHEDULE screen, highlight the individual breaker to configure and then select BREAKER.

Breakers with blank rating (RTNG) values are not yet configured. See “Breaker Numbering” on page 37 for an explanation of breaker numbering.


5. On the PANEL X BREAKER METERS screen, select CONFIG and then configure the individual breaker’s meter settings:




NOTE *Configure a breaker only if its CT is installed.*

Default	Range	Meter Setting	Description
1	1–3	PHASES	Number of phases
20	10–100	RATING	Branch breaker rating (in amps) NOTE Subfeed breaker rating range is 100–1200.
80	0–100	WARNING	Warning threshold level (in percent load)*
90	0–100	OVERLOAD	Alarm threshold level (in percent load)*
71.9	10–100	CT	CT ratio

* Alarm automatically turns off when the load drops below the threshold level.

6. When the individual circuit configuration is complete, select OK to return to the PANEL SCHEDULE screen to configure the next breaker.
7. When all branch circuit configuration is complete, select the  button repeatedly to reach the main menu.
8. If all configuration is complete, save your changes by pressing the Reset button on the Power Xpert Gateway Card in the X-Slot communication bay. (The card automatically resets after five minutes.)

To remove a breaker from the panel:

1. If not already obtained, access the System Setup Level 1 password level. See "Accessing Configuration" on page 43.
2. From the main menu, select METER then PANEL.
3. Highlight the panel number (PNL), and then select SCHEDULE.
4. Highlight the breaker to remove, and then select BREAKER and DELETE.
5. Select the  button repeatedly to reach the main menu.
6. If all configuration is complete, save your changes by pressing the Reset button on the Power Xpert Gateway Card in the X-Slot communication bay. (The card automatically resets after five minutes.)

To change a breaker's settings:

1. If not already obtained, access the System Setup Level 1 password level. See "Accessing Configuration" on page 43.
2. Follow the steps to remove a breaker from the panel.
3. Follow the steps to configure a breaker.

Viewing Panel Meters



NOTE Use this section only if the optional display is installed.

To view the meters for the panels:

1. From the main menu, select METER then PANEL.
2. Use the arrow keys to scroll through the panel meters (listed in Table 7 on page 41).

To reset a panel's meter statistics, scroll to the last panel screen, highlight the panel number, and select RESET.

3. When viewing is complete, select the ← button repeatedly to reach the main menu.

Viewing Breaker Meters



NOTE Use this section only if the optional display is installed.

To view the meters for the breakers:

1. From the main menu, select METER then PANEL.
2. On the PANEL screen, select the panel number (PNL) to view, and then select SCHEDULE.
3. The PANEL SCHEDULE screen shows each breaker's alarm status and rating. Use the up and down arrow keys to scroll through the list of breakers.
4. To view the meters for an individual breaker, highlight the breaker number, and then select BREAKER.

The PANEL X BREAKER METERS screens show meters for the selected breaker (listed in Table 8 on page 41). Use the left and right arrow keys to scroll through the meters.

5. When viewing is complete, select the ← button repeatedly to reach the main menu.

Chapter 4 Communication

This section describes the communication features of the Energy Management System (EMS) Upgrade Kit (EMS-UGK):

- Serial port (Service)
- X-Slot card (Power Xpert Gateway Series 1000 Card)
- Relay output contacts (Alarm Relay)
- Programmable signal inputs (Building Alarms)

Figure 20 shows the location of the communication features.

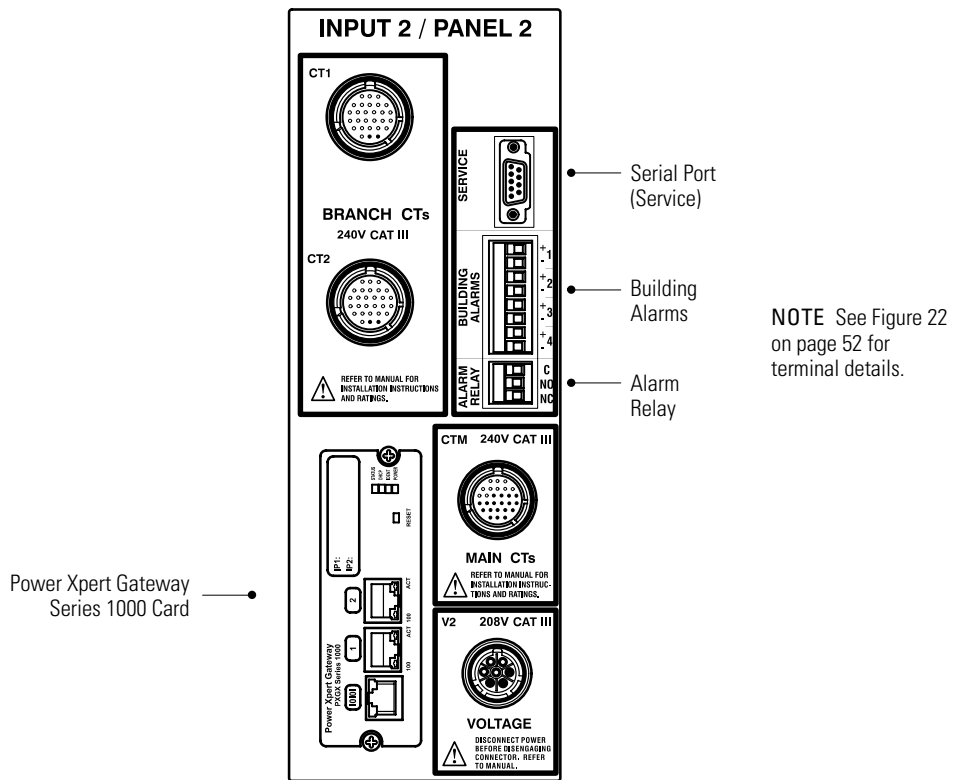


Figure 20. Communication Features (EMS-UGK-LV Model with Dual Panel Option Shown)

Installing Communication Features

To install the communication options and control terminals:

- 1. Install and connect the appropriate cable(s).

See the following section, “Communication Options,” or “Control Terminals” on page 52 for detailed information.
- 2. Route and tie the cable(s) out of the way.

Communication Options

The EMS-UGK has serial communication capabilities through the serial port or through the X-Slot card.

Serial Port (Service)

To establish communication between the EMS-UGK and a computer, connect your computer to the EMS-UGK serial port using a communication cable (not supplied).

If the optional conduit box is installed, a DB-9 extender cable (supplied) provides access to the port.

The cable pins are identified in Figure 21 and the pin functions are described in Table 10. See Figure 20 for the serial port location.

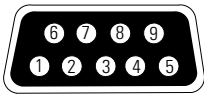


Figure 21. Serial Port

Table 10. Serial Port Pin Assignment

Pin Number	Signal Name	Function	Direction from the EMS-UGK
2	TxD	Transmit to external device	Out
3	RxD	Receive from external device	In
5	GND	Signal common (tied to chassis)	—

Use the computer's HyperTerminal® (or equivalent) application to access Terminal mode. Table 11 lists available keystroke combinations for using Terminal mode through the EMS-UGK communication port.

Table 11. Terminal Mode

Key Combination*	Display	Comment
[ESC] [A]	Active Events	Displays a list of active events.
[ESC] [H]	History Log	Prints the History Log with a firmware version header, beginning with the oldest entry. Alarms that occur while the log is printing are included in chronological order. System events are continually logged through the serial port to the device connected to the port.
[ESC] [P]	Profile Log	Prints the Profile Log, beginning with the oldest entries.
[ESC] [V]	All screens (video mode)	Navigate the screens just as on the EMS-UGK's display, substituting the keyboard keys 1, 2, 3, 4, and 5 for the five pushbuttons on the EMS-UGK display. The indicators display as text to the right of the main screen.

* Hold down the [ESC] key and press the letter key.

X-Slot Card

The Power Xpert Gateway Series 1000 Card installed in the X-Slot communication bay provides remote monitoring through a Web browser interface, e-mail, and a network management system using SNMP; connects to a twisted-pair Ethernet (10/100BaseT) network. Modbus® TCP support provides direct integration of a monitored panel's parameters to a Building Management System (BMS). It has a built-in switching hub that allows one additional network device to be connected to the network without the requirement of an additional network drop.



NOTE LAN drops for use with the X-Slot card must be provided by the customer.

See Figure 20 on page 49 for the location of the X-Slot communication bay.

Control Terminals

The cables should be connected to the control terminals with a mating connector. The relay contact terminals have functional electrical isolation from the system. The building alarms share a common (–) through 100 ohms, and have functional electrical isolation from the system, but not from each other.

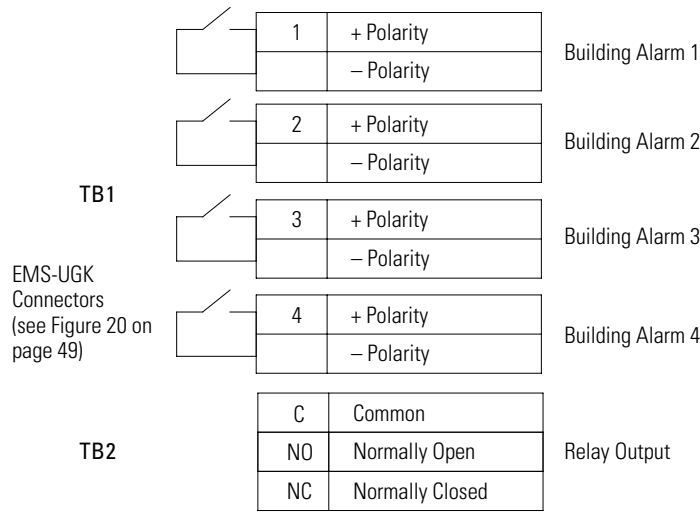


Figure 22. External Control Terminal Connections

NOTE If using a semiconductor switch type, pay attention to the proper polarity. A relay or other contact closure is preferred.

Relay Output Contacts (Alarm Relay)

The EMS-UGK incorporates a programmable relay output with potential free contacts for remote alarm indications.

The SPDT (single pole double throw) relay provides both NO and NC contacts. These contacts can be connected to equipment at the facility (such as a light or an alarm bell) to signal when an alarm is active on the EMS-UGK. This feature is useful if the EMS-UGK is located in a remote area where the EMS-UGK horn may not be heard immediately.



WARNING

The relay output contacts must not be connected to any utility connected circuits. Reinforced insulation to the utility is required. The relay output contacts have a maximum rating of 8A at 32 Vdc or less, derate to 1A at 60 Vdc. Do not operate above 42.4 Vpk or 60 Vdc.

Programmable Signal Inputs (Building Alarms)

The EMS-UGK incorporates four programmable signal inputs, each with a signal and a signal return. When the signal is shorted, the input is read as active. The pins must be shorted with maximum resistance of 10 ohm to activate the specific input. Seventeen milliamps are required to drive the signal active.



NOTE See Figure 22 on page 52 for the polarity and verify these connections if polarity control is required.

This feature lets you connect the EMS-UGK to your building alarms, such as smoke detectors or overtemperature alarms. For each building alarm, you can set:

- The building alarm name
- The contact type (NO or NC)
- The building alarm type



NOTE A building alarm programmed for REPO will trigger the REPO alarm and the alarm associated with the building alarm number.

- The notice level

To configure the building alarms, see “Setup Options” on page 42.

Chapter 5 Maintenance

Keep the area around the hardware and wiring clean and dust-free. Wipe with a dry cloth as needed. The Energy Management System (EMS) Upgrade Kit (EMS-UGK) does not require an annual calibration.

Recycling the Used Equipment

Contact your local recycling or hazardous waste center for information on proper disposal of the used equipment.



CAUTION

Do not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

Updating the Firmware

To keep the firmware updated with the latest improvements and benefits, visit **www.powerware.com** often for updates. You can download the latest firmware version and the instructions for installing it.

Replacing the Power Xpert Gateway Series 1000 Card

The card can be replaced easily without turning the EMS-UGK off or disconnecting the load. Follow the instructions included with the card. If the optional conduit box is installed:



NOTE See Figure 4 on page 12 for the location of conduit box components.

1. Remove the front plate on the right conduit box. Retain the plate and screws for later reinstallation.
2. Remove the card cover plate at the bottom right of the right conduit box. Retain the plate and screws for later reinstallation.
3. Follow the instructions included with the card to remove the old card, replace with the new card, and verify operation.
4. Reinstall the card cover plate and front plate.

Rewiring and Reconfiguring the Installation



DANGER

This EMS-UGK contains **LETHAL VOLTAGES**. All repairs and service should be performed by **AUTHORIZED SERVICE PERSONNEL ONLY**. There are **NO USER SERVICEABLE PARTS** inside the EMS-UGK.



WARNING

- Only qualified service personnel (such as a licensed electrician) shall perform the electrical installation. Risk of electrical shock.
 - Always follow all personal protective equipment (PPE) and other safety rules when working around electricity.
-

To rewire and reconfigure the EMS-UGK:



CAUTION

Before rewiring the EMS-UGK, disconnect the load and shut down the host equipment. Refer to the user's guide for the host equipment for shutdown instructions.

1. Depending on the rewiring involved, follow the appropriate installation steps 1 through 20 (starting on page 13) to update the harness and CT connections. **Observe all warnings and cautions associated with the installation steps.**
2. For each updated connection, reconfigure the appropriate settings in the EMS-UGK using the supplied software configuration tool, a web page interface, the Advanced Metering monitoring system, or (if the optional display is installed) directly through the display. See "Initial Configuration" on page 25.
3. Activate the reset switch on the bottom of the electronics module: hold the switch for 10 seconds or until the display (if installed) turns off, then release the switch.
4. Verify the rewired and reconfigured installation operates as intended.

Chapter 6 Specifications

Table 12. Dimensions and Weight

Component	Weight	Dimensions (WxHxD)
Electronics module (dual panel with display)	8.2 kg (18 lb)	377 × 284 × 118 mm (14.8" × 11.2" × 4.6")
Electronics module (dual panel without display)	7.7 kg (17 lb)	377 × 284 × 113 mm (14.8" × 11.2" × 4.5")
Conduit box (each side)	1.6 kg (3.6 lb)	128 × 287 × 113 mm (5.0" × 11.3" × 4.5")
Mounting bracket	1.5 kg (3.4 lb)	See Note 2
Harnesses (each):		
Branch circuit	0.7 kg (1.6 lb)	—
Voltage	0.4 kg (0.8 lb)	
Main input	0.2 kg (0.4 lb)	
Split-core CTs (each):		
Branch, 75A	0.07 kg (0.15 lb)	
Branch, 100A	0.10 kg (0.22 lb)	—
Main, 400A	0.71 kg (1.56 lb)	
Input ground, 100A	0.51 kg (1.13 lb)	
Advanced Metering external cables	0.9 kg (2 lb)	—

NOTE 1 Weight varies depending on installed options.

NOTE 2 Weights and dimensions for electronics module include mounting bracket but do not include connectors or reset switch. Dimensions vary depending on installed options.

Table 13. Communication Options

X-Slot Communication Bay	Power Xpert Gateway Series 1000 Card
Serial Port	DB-9 (RS-232)
Signal Inputs	(4) programmable inputs (signal and signal return) for indicating building alarms or other use NOTE Signal only (at 17 mA); action power must be supplied externally.
Relay Output Contacts	(1) relay output for indicating alarm condition present NO and NC relay contacts are rated at 8A at 32 Vdc or less, derate to 1A at 60 Vdc.

Table 14. Electrical Input

Nominal Voltage	EMS-UGK-LV: 208/120V EMS-UGK-HV: 380/220V, 400/230V, 415/240V
Nominal Frequency (Range)	50/60 Hz (45–65 Hz)
Input Conductor Configuration	Panel 1: 3 wire + N + Gnd Panel 2: 3 wire + N
Current Rating	0.29A

Table 15. Environmental and Safety

Operating Temperature	0°C to 40°C (32°F to 104°F)
Nonoperating Temperature	-55°C to 85°C (-67°F to 185°F)
Relative Humidity	0–95% noncondensing
Operating Altitude	Up to 2,000 meters (6,600 ft) above sea level
Nonoperating Altitude	Up to 12,200 meters (40,000 ft) above sea level
Acoustical Noise	<45 dB, excluding alarms
EMI Suppression	FCC 47, part 15, for Class A devices
Electrostatic Discharge (ESD)	IEC 61000-4-2 Up to 8 kVA pulse without damage and no adverse effect to critical load
Agency Markings	UL 61010-1, CSA C22.2 No. 61010-1, CE Mark, IEC 61010-1:2001-02
Installation Category	Installation Category III For measurements performed in the building installation on equipment such as panelboards, circuit breakers, wiring, and like equipment.

Table 16. Display (Optional)

Interface	Backlit LCD panel with 8 lines by 40 characters (approximately 64 × 240 pixels), 4 LED indicators, and 5 pushbuttons
------------------	---

Table 17. Metering

Panel Monitoring Rating	Maximum 400A CT1, CT2, CTM connections: 240V CAT III V1, V2 connections: 208V CAT III for EMS-UGK-LV, 415V CAT III for EMS-UGK-HV
Branch Circuits	Monitors up to 84 individual branch circuit breakers (two 42-circuit panels)
Calibration	Fully calibrated at the factory
Clock	Real Time Clock (RTC) with one-second resolution, automatic leap year adjustment, and one month backup time
Sampling Frequency	Current and voltage for each breaker sampled 2000 times per second with a bandwidth of 1 KHz
Current Accuracy	Main input: $\pm 2\%$ from 10–100% of full range Branch circuit: $\pm 5\%$ from 10–100% of full range
Voltage Accuracy	$\pm 2\%$
Blinding Thresholds (zeroing of low meters)	Panel breakers: 1/16 of breaker rating Main current: <6A Neutral current (installed Neutral CT): <6A Neutral current (calculated Neutral): <15A THD alarming: Phase current <20% of maximum phase current rating

SPECIFICATIONS

Chapter 7 Troubleshooting

Typical Alarms and Conditions

The following table describes typical alarms and conditions for the EMS-UGK. For further help, please contact the Help Desk.

To silence the horn, press any button.

To view the active alarms or alarm history, select EVENTS on the optional display, then ACTIVE EVENTS or HISTORY.

If the optional display is not installed, view the data through your communication interface.

Alarm or Condition	Possible Cause	Action
The EMS-UGK appears frozen or locked up.	Need to cycle power.	Activate the reset switch on the bottom of the electronics module: hold the switch for 10 seconds or until the display (if installed) turns off, then release the switch.

Service and Support

If you have any questions or problems with the EMS-UGK, call your **Local Distributor** or the **Help Desk** at one of the following telephone numbers and ask for an EMS-UGK technical representative:

United States: **1-800-356-5737 or 1-919-870-3149**
Canada: **1-800-461-9166 ext 260**
All other countries: **Call your local service representative**

Please have the following information ready when you call for service:

- Model number
- Serial number
- Date of failure or problem
- Symptoms of failure or problem
- Customer return address and contact information

Chapter 8 Warranty

Limited Factory Warranty

Powerware Energy Management System (EMS) Upgrade Kit

WARRANTOR: The warrantor for the limited warranties set forth herein is Eaton Electrical Inc., a Delaware Corporation ("Eaton").

LIMITED WARRANTY: This limited warranty ("Warranty") applies only to the original end-user ("End-User") of the Powerware EMS Upgrade Kit ("Product") and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by Eaton for resale to an End-User.

LIMITED WARRANTY PERIOD: The period covered by this Warranty for Product installed [and currently located] in the fifty (50) United States and the District of Columbia is twelve (12) months from the date of Product shipment for parts replacement. The period covered by this Warranty for Product installed [and currently located] outside of the fifty (50) United States and the District of Columbia is twelve (12) months from the date of Product shipment for parts replacement.

WHAT THIS LIMITED WARRANTY COVERS: The warrantor warrants that the Powerware EMS Upgrade Kit and Eaton-provided accessories (individually and collectively, "Warranted Items") are free from defects in material and workmanship. If, in the opinion of Eaton, a Warranted Item is defective and the defect is within the terms of this Warranty, Eaton's sole obligation will be to repair or replace such defective item (including by providing service, parts, and labor, as applicable), at the option of Eaton. Any parts that are replaced may be new or reconditioned. All parts replaced by Eaton shall become the property of Eaton. The End-User shall return the defective part or parts to a location specified by Eaton.

WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, fire, flood, lightning, vandalism, acts of God, End-User's neglect, abuse, misuse, misapplication, incorrect installation; (d) repair or alteration not authorized in writing by Eaton personnel or performed by an authorized Eaton Customer Service Engineer or Agent; or (e) improper testing, operation, maintenance, adjustment, or any modification of any kind not authorized in writing by Eaton personnel or performed by an authorized Eaton Customer Service Engineer or Agent.

This Warranty is not valid: (a) if the Product is moved to a new location by someone other than an authorized Eaton Customer Service Engineer (in the USA) or Agent (outside of the USA); or (b) if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof. Labor warranty is not provided. Any equipment, parts, or materials included in the Product and not manufactured by Eaton are warranted solely by the manufacturer of such equipment, parts, or materials and are not included as part of this Warranty.

THIS WARRANTY IS THE END-USER'S SOLE REMEDY AND IS EXPRESSLY IN LIEU OF, AND THERE ARE NO OTHER EXPRESSED OR IMPLIED GUARANTEES OR WARRANTIES (INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE, WHICH ARE EXPRESSLY DISCLAIMED).

LIMITATION OF LIABILITY: In no event shall Eaton be liable for any indirect, incidental, special, or consequential damages of any kind or type whatsoever, or based on any claim or cause of action, however denominated. Eaton shall not be responsible for failure to provide service or parts due to causes beyond Eaton's reasonable control. In no case will Eaton's liability under this Warranty exceed the replacement value of the Warranted Items.

WARRANTY

END-USER'S OBLIGATIONS: In order to receive the benefits of this Warranty, the End-User must use the Product in a normal way, follow the Product's user's guide, and protect against further damage to the Product if there is a covered defect.

OTHER LIMITATIONS: Eaton's obligations under this Warranty are expressly conditioned upon receipt by Eaton of all payments due to it (including interest charges, if any). During such time as Eaton has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Eaton shall have no obligation under this Warranty. Also during such time, the period of this Warranty shall continue to run and the expiration of this Warranty shall not be extended upon payment of any overdue or unpaid amounts.

COSTS NOT RELATED TO WARRANTY: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Warranty. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Eaton representatives outside the terms of this Warranty will be borne by the End-User.

OBTAINING WARRANTY SERVICE: In the USA, call the Eaton Customer Reliability Center 7x24 at 800-843-9433. Outside of the USA, call your local Eaton sales or service representative, or call the Eaton Customer Reliability Center in the USA at 919-870-3028. For comments or questions about this Limited Factory Warranty, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.



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